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Control of Vole Damage in No-till Soybeans



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Control of Vole Damage in No-till Soybeans

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Introduction

Voles are a problem for farmers using minimum and no-till technologies for soybean production, because voles feed on soybeans from the time they are established until they are harvested. This problem is expected to increase as land enrolled in the Conservation Reserve Program (CRP) is returned to row crops. Retaining established cover through no-till farming decreases erosion, improves water quality, increases wildlife habitat and conserves moisture when compared to conventional tillage practices. However, voles that have established colonies and flourished beneath the cover established under CRP, crop residue or hay crops can devastate crop plantings. Significant stand reductions have been reported in no-till soybeans where vole numbers are high.

Vole Description and Biology

Voles are small, stocky rodents, normally 4 to 7 inches long, varying from brown to gray with dense under-hair and longer guard-hair. They have short legs and tails and their bodies are torpedo-shaped. The eyes and ears are relatively small, with the ears partially hidden by hair.

Five species of voles are native to Tennessee: southern redback vole (*Clethrionomys gapperi*), rock (or yellownose) vole (*Microtus chrotorrhinus*), pine

vole (*Microtus pinetorum*), meadow vole (*M. pennsylvanicus*) and prairie vole (*M. ochrogaster*). Southern redback and rock voles are found in the woodlands of the southern Appalachians. Pine voles inhabit both forested and open areas; however, they are typically found in forested habitats, using extensive burrow systems. Although prairie and meadow voles depend on herbaceous, overhead cover to provide protection from predators, prairie voles prefer dry, open grassland sites as opposed to meadow voles, which prefer moist areas. Thus, the prairie vole is the pest responsible for most of the damage to no-till soybean crops in Tennessee and will be the main species discussed relative to this problem. Fields managed under no-till conditions provide excellent habitat for prairie voles. High-quality forage and grains provide both food and cover, as plant material at ground level shields the voles from predators.

The number of voles in an area can increase very rapidly under ideal conditions. Females become sexually mature at 35 to 40 days old and are capable of producing a litter of three to four young after a gestation period of 21 days. Typically, prairie voles produce three to four litters per season, with most



births occurring March through September. Consequently, a few voles with adequate food and cover can produce a dense population in a relatively short period of time, posing a real threat to soybean crops.

Voiles feed actively both day and night throughout the year on a wide variety of foods. High-protein grasses and legumes are their favorite foods, but they also feed readily on grains (such as corn, soybeans and wheat) when available. Most voiles create a network of aboveground runways 1 to 2 inches wide through existing vegetation. Active runways are littered with grass clippings and droppings. Among the aboveground runways are holes leading to an associated underground tunnel system. This system of runways and tunnels can be home to a pair of adult voiles and their young or a colony of numerous adults and young. The feeding radius of a vole colony may be only 10 to 15 feet in excellent habitat; however, the feeding area normally averages $\frac{1}{4}$ acre.

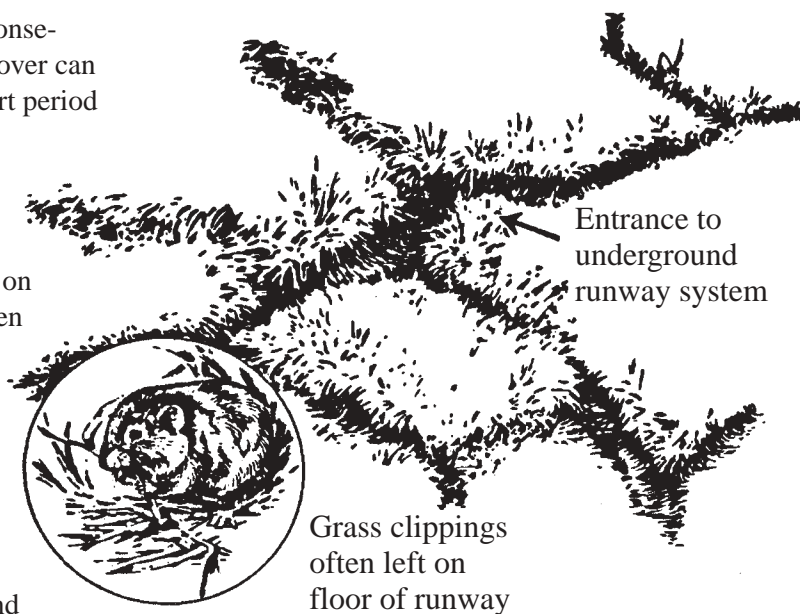
Vole Damage

Damage to no-till soybeans can occur across the field from planting through harvest. In conventional-till soybeans, vole damage usually occurs around field edges and along vegetated waterways where voiles thrive under the established vegetative cover with supplemental food nearby. Immediately after planting, voiles feed on soybean seed and seedlings, leaving few to no soybeans around their dens. Weeds grow in these areas instead of soybeans, leaving unproductive sites that can generate weed problems years later. Once soybeans get tall enough that voiles cannot clip off the top of the plant, the pests begin feeding on newly formed leaves, using the soybean canopy to conceal themselves from predators. Once soybean pods begin to form, voiles feed upon and store the pods and seed until harvest. Stored beans are used as food through the winter.

Management of Vole Damage

Pre-plant Scouting

The first step in preventing vole depredation is to scout fields and borders to determine if voiles are present at economically significant levels. This survey



should be conducted 45 days before planting to allow time to implement damage control measures. Areas with good drainage and soil aeration are most attractive to prairie voiles and should be surveyed first for active colonies. Dark green, high spots in grass areas often indicate the presence of a colony. Nutrients added to the soil from urine and decaying feces are responsible for the dark green color and increased growth. Fresh clippings and/or fresh droppings next to a slick, open hole indicate the den is active. Control measures should be planned when five or more active colonies per acre are located. Other areas to check are around weed patches and big bales of hay that serve as nurseries.

Toxicants

Currently, no toxicants are approved for use in cropland where soybeans are to be planted. However, zinc phosphide baits can be broadcast or drilled into odd areas within fields (e.g., old home sites and rocky areas that cannot be planted) and sites adjacent to fields where soybeans are to be planted. Zinc phosphide is a restricted-use pesticide (actually a single-dose rodenticide) often available as impregnated bait on grains such as oats, corn, wheat or peanuts. Drilling these baits into the soil eliminates danger to most non-target animals, yet allows easy access for voiles. In a recent test, rates as low as one pound of bait per acre have proven effective at controlling low-density vole populations. Higher rates (e.g., four to six pounds per acre) are needed for high-density vole populations.

Repellents

There are no repellents labeled for voles for use in soybean fields.

Cultural Practices

Vole populations also can be reduced by making the habitat less attractive. Removing cover and food sources can cause voles to disperse to another area. Destroying habitat does not necessarily kill voles; however, they may become more vulnerable to predators and some may die from mechanical treatments (e.g., mowing). Adequate time must be given between treatment and planting to allow the rodents to leave. Rapid re-growth of vegetation can decrease the effectiveness of this method.

Although tillage eliminates burrows and runways, as well as cover and food for voles, crop establishment costs and erosion may increase while water quality and habitat for other wildlife species may decline. In addition, tillage also violates some farms' conservation plans.

Applying burn-down herbicides 30 days prior to planting has consistently produced good results. This early herbicide application may replace the application at planting. For appropriate herbicides and rates, contact your county Extension office and refer to the current **Weed Control Manual for Tennessee Field Crops** (Extension PB 1580).

Hay removal, low mowing, pasturing and controlled burning prior to planting can be successful in reducing vole damage to no-till soybean crops. However, re-growth following these practices is highly nutritious and the desired effect may be reduced.

Haying and controlled burns should be completed 30 days prior to planting, allowing the voles time to leave the field before seeds are planted. If planting is conducted before the voles leave the site, depredation problems are probable. A combination of cutting and bailing the vegetation, then applying herbicide is effective. Mowing fields and borders close to the ground in late fall may discourage voles from establishing colonies; however, this practice is not recommended because it eliminates winter cover essential for many species of wildlife, especially rabbits and quail.

Pasturing can be used to eliminate standing vegetation. Intensive grazing should be used to eliminate as much cover as possible. Livestock should remain on the area until planting time so cover cannot re-establish and voles return to the field.

Alternative Feeding

Researchers have found that only whole soybeans have been effective as an alternative food source for voles. These should be distributed evenly across the field using a fertilizer spreader two days prior to seeding. Any existing vegetation should be dry, to allow the grain to fall to the ground. One bushel of whole soybeans has been found adequate for control. Increased amounts have not resulted in increased crop yields. The critical period for preventing vole damage to soybean seedlings is three to four weeks after planting. Afterwards, voles tend to feed on newly formed leaves instead of consuming entire plants.

The introduction of herbicide-resistant crops, such as Roundup Ready® soybeans, makes alternative feeding a more attractive option. Standard seed can be broadcast prior to planting Roundup Ready® crops. Later, any standard soybeans that germinate can be controlled with Roundup® with no harm to the field crop.

Drilling vs. Planting in Rows

Researchers have found that drilling soybeans is more productive than planting in rows when a large vole population is present. The increased number of soybean plants established by drilling compensates for those removed by voles. Also, voles destroy a smaller portion of the crop when more seed is planted.

Predators

Voies have a host of natural predators, including snakes, hawks, owls, coyotes and foxes. However, the predator community generally is ineffective at controlling vole populations when a dense herbaceous canopy is present. When overhead cover is significantly reduced or eliminated, predation is increased.

Conclusions

Voies are not a problem in all fields planted to no-till soybeans. Therefore, it is important to survey areas to be planted to determine if control measures are needed. Use of effective damage control techniques has consistently returned at least an additional \$100 per acre at harvest where voies have been found to be a problem. Researchers recommend a program that includes early burn-down herbicide applications to be most effective, efficient and safe for the environment. However, a combination of the techniques mentioned above may prove most effective.

Recommendations for vole control in no-till soybeans:

1. Scout fields for voles at least 45 days prior to planting crops.
2. If more than five active colonies per acre are found during the survey, plan a prevention program.
3. Remove existing cover and kill any re-growth. Early burn-down herbicides should be applied approximately 30 days prior to planting.
4. Scout again for active vole colonies approximately one week before planting. If less than six active colonies per acre are found, plant when ready. If more than five active colonies are found, apply alternative foods.
5. When using alternative foods, apply grains alone or mixed with dry fertilizer at least two days prior to planting. Vegetation should be dry when spreading to allow the grain to fall to the ground.
6. Plant crop via no-till technology.

In addition, baits treated with zinc phosphide are approved for use in non-cropland areas. If a program including toxic bait is necessary, 4 to 6 pounds per acre of zinc phosphide pellets can be drilled or broadcast into odd areas within fields (e.g., old home sites and rocky areas that cannot be planted) or sites adjacent to fields to provide additional control. Drilling the toxic bait into the soil reduces danger to non-target animals. Control of vole damage is an ongoing process of surveying fields for voles and implementing control measures when a substantial population of voles is discovered.

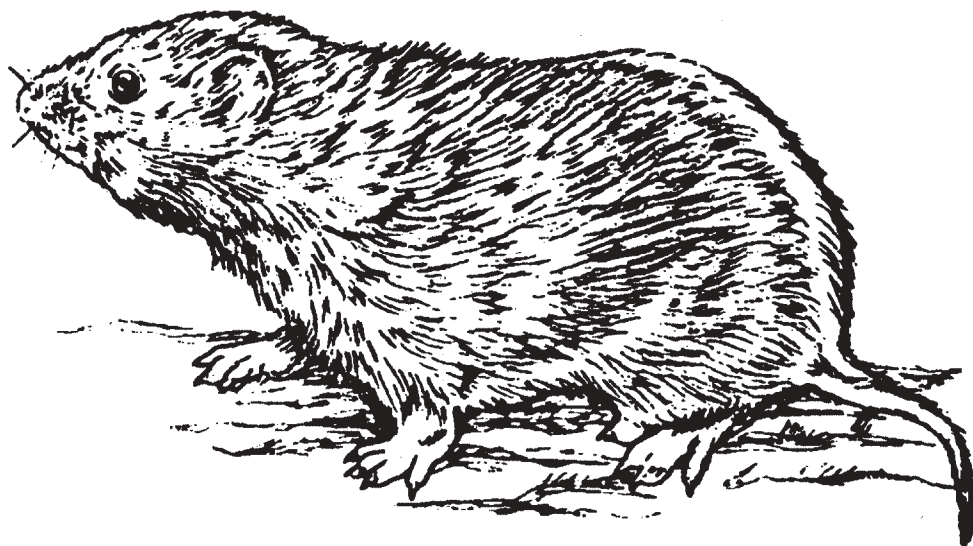
Some of the information in this publication was adapted from the following sources:

Vole damage control when converting CRP to crop production in the Midwest in 1997, by Ron Hines, Senior Research Specialist, University of Illinois, Dept. of Crop Sciences, R.R.#1, Box 256, Simpson, Illinois 62985 and Dennis Epplin, Extension Educator, Crop Systems, University of Illinois Extension Center, 4112 N. Water Tower Place, Mt. Vernon, Illinois 62864

Voies, by John M. O'Brien, Agricultural Programs Coordinator, Nevada Department of Agriculture, Reno, Nevada 89510, in *Prevention and Control of Wildlife Damage-1994*, University of Nebraska, B-177-182.

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